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WORK PLAN
for
PHASE 1 AND PHASE 2
FEASIBILITY STUDIES
for the
FORMER GENERAL ELECTRIC SPOKANE FACILITY

Prepared for
GENERAL ELECTRIC COMPANY

By
Bechtel Environmental, Inc.

San Francisco, CA

May 1990



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Section 1

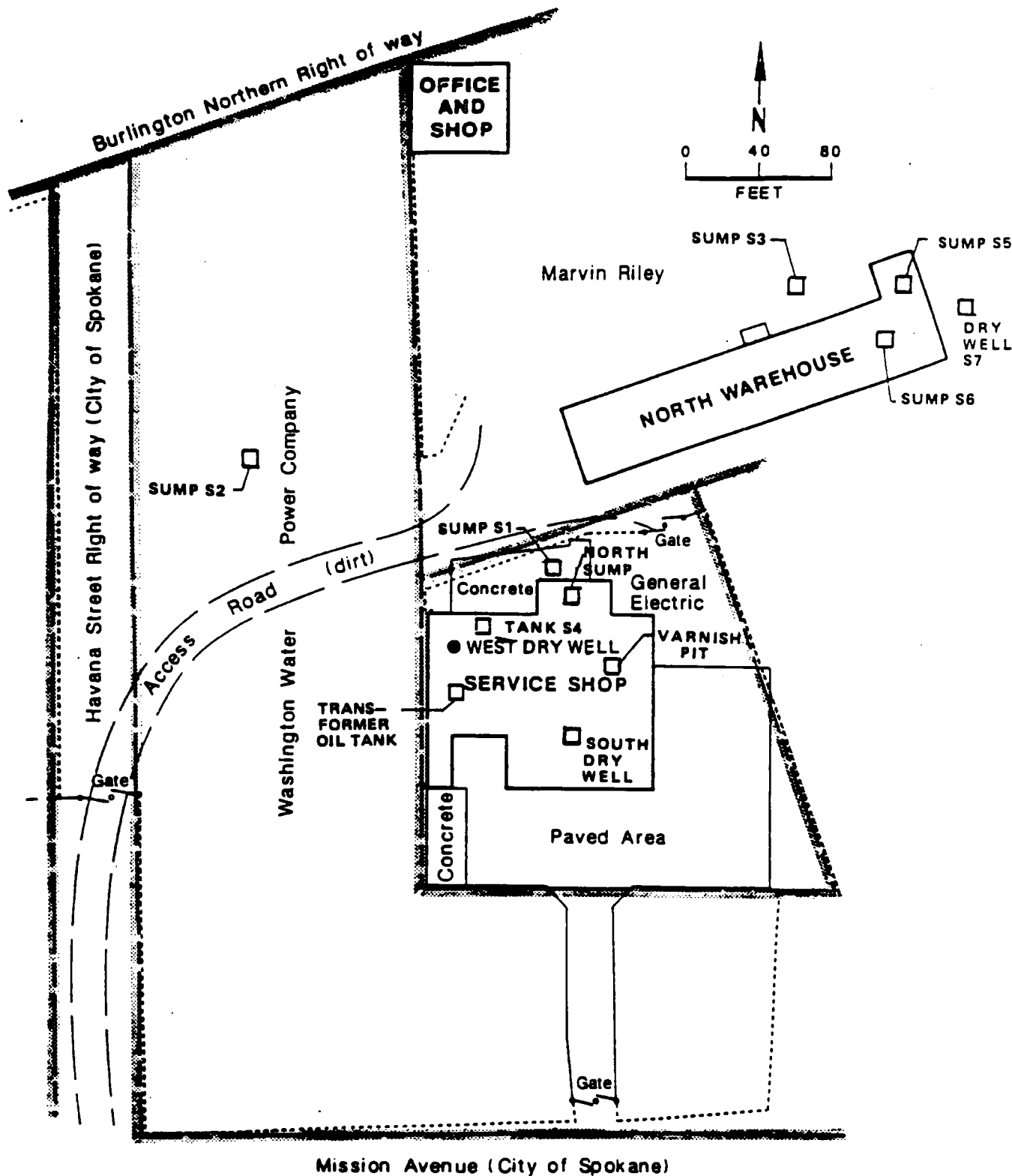
INTRODUCTION

This work plan was prepared for General Electric Company (GE) to address remedial alternatives for the former GE Apparatus Service Shop and adjacent properties (the site) located at East 4323 Mission Avenue, Spokane, Washington. As outlined in the State of Washington Department of Ecology's (Ecology) letter of November 24, 1989 to GE, remedial alternatives for specified contaminated media at the site will be evaluated in two separate phases. Each phase will require an independent Feasibility Study (FS).

This work plan contains a review of existing data and outlines the Phase 1 and Phase 2 Feasibility Study work which will be performed to develop site specific remedial alternatives and to select a cost effective remedial action for abatement of contaminated media at the site. The Phase 1 FS will address contaminated soils above the water table, contamination beneath and around underground structures and remaining portions of contaminated concrete, soil and debris not removed as part of the interim actions and Phase 4 Remedial Investigation (RI). Cleanup alternatives for the ground water and contaminated deep soils related to ground-water table fluctuations will be addressed in the Phase 2 FS. This work plan has been prepared in accordance with EPA's "Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA" (October, 1988) and pursuant to WAC 173-340 "Model Toxics Control Act Proposed Cleanup Regulations" (December, 1989).

1.1 SITE HISTORY

The site is comprised of three properties owned by GE, Washington Water Power Company and Mr. Marvin E. Riley. Site facilities are shown on Figure 1-1. GE operated the Apparatus Service Shop for the repair of industrial and electrical equipment, including transformers, between the years 1961 to 1980. As part of the shop operation, steam cleaning was performed in the western and northern portions of the facility and runoff was collected in several underground sumps and ultimately discharged to dry wells.



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GENERAL ELECTRIC/SPOKANE			
SITE PLAN			
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	19099	Figure 1-1	

Ecology inspected the facility on October 15, 1985. Soil and sludge samples were collected from the site for laboratory analysis. The results indicated the presence of polychlorinated biphenyls (PCBs) and metals. GE has conducted three phases of remedial investigation (RI) at the site to date. The Phase 1 and 2 investigations were performed by Bechtel National, Inc. (Bechtel) and Phase 3 was conducted by Golder Associates (Golder).

Bechtel and Golder have prepared two remedial investigation work plans (Phase 4 and Phase 5 RI, respectively) for GE which outline work to further characterize site conditions and provide the necessary information to complete the Phase 1 and Phase 2 feasibility studies (FS). The Phase 4 RI work plan objectives include definition of the horizontal and vertical extent of contamination in the soils in the West Dry Well area and to characterize the extents of contamination beneath the Service Shop and North Warehouse floors, beneath adjacent concrete pads and asphalt paving, and in the vicinity of the remaining eleven underground structures. The Service Shop, sumps and related concrete and asphalt structures and pads would be removed to facilitate the investigation. This work would be completed prior to completion of the Phase 1 FS. The Phase 5 RI includes installation of five or six additional ground-water monitoring wells to further characterize the vertical and horizontal geometry of the PCB plume in the site vicinity and to gather additional hydraulic and chemical data. This information will be used to support the Phase 2 FS. A baseline risk assessment will be performed to evaluate the potential threat to human health and the environment. This information will be used to develop remedial action objectives as part of the FS process.

1.2 WORK PLAN OBJECTIVES

The primary objectives of this work plan are to describe procedures to:

- Conduct a detailed Phase 1 Feasibility Study of remedial alternatives for contaminated soils above the water table and remaining contaminated concrete and debris
- Conduct a detailed Phase 2 Feasibility Study of remedial alternatives for contaminated ground water and soils near the ground-water table.

The results of previous remedial investigation work are briefly summarized in Section 2. Section 3 outlines the Feasibility Study process to evaluate remedial alternatives. Evaluation of alternatives will be performed in both the Phase 1 and Phase 2 Feasibility Studies. The work schedule and deliverables are described in Section 4.

Section 2

SUMMARY OF REMEDIAL INVESTIGATIONS

This section provides a brief summary of previous remedial investigations conducted at the GE Spokane site.

The Phase 1 investigation involved excavating 58 shallow soil sample pits (to a depth of three feet) in the area surrounding the former Service Shop and drilling and sampling subsurface soils (Bechtel 1986a). Analyses were performed for PCBs and priority pollutant metals.

Results of the investigation indicated PCB concentrations ranged from 10 to 100 parts-per-million (ppm) in surface soil samples (0-0.5 feet) located in the area north of the former Service Shop. Concentrations were less than 1 ppm at the three foot level, except for two pits (1.47 ppm maximum). The highest PCB concentrations were located in the sample pits west and south of the former Apparatus Service Shop. Concentrations ranged from 135 ppm to nearly 27,000 ppm in the surface soil samples and from 1 ppm to 10 ppm at a depth of three feet. Elevated concentrations of copper, lead and zinc were detected in samples from several test pit locations. Figure 2-1 shows apparent distribution of PCBs in near surface soils.

PCB concentrations ranged from 4,000 ppm to 10,000 ppm in the boring samples collected from the depths of 9 feet to 20 feet below the shop floor in the West Dry Well area. The highest PCB concentration was reported to be 21,400 ppm at a depth of 21.2 feet below the shop floor. Elevated metals concentrations were reported in several shallow soil boring samples (0-7.4 feet). Volatile organic compounds were also detected in several samples.

Phase 1 activities included investigation of the adjacent North Warehouse owned by Mr. Riley (Bechtel, 1986b). The results indicated that the concrete floor slab at the east end of the warehouse is contaminated, and that PCBs are present in or beneath four underground liquid drainage or collection structures at the warehouse.

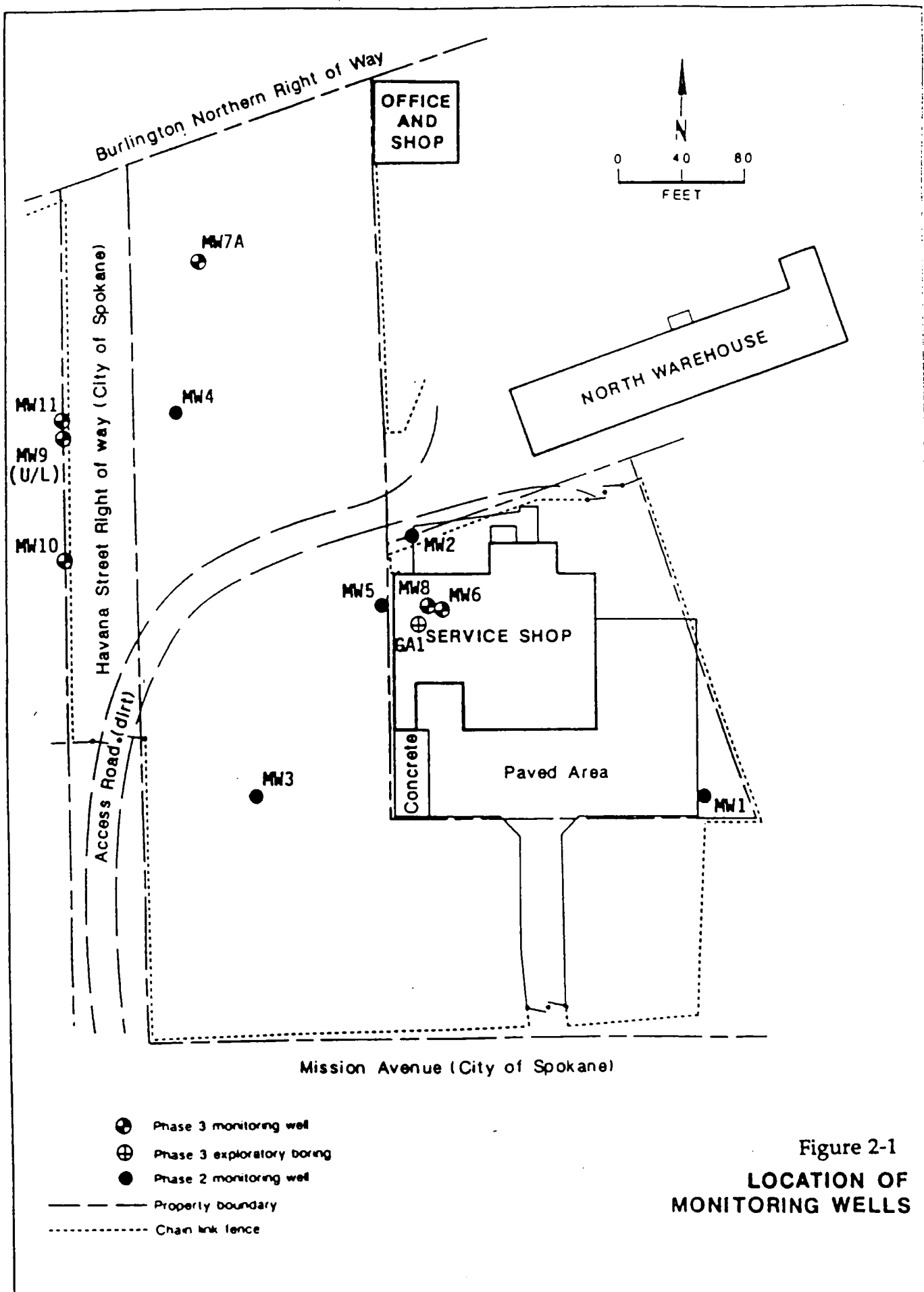


Figure 2-1
LOCATION OF
MONITORING WELLS

(Courtesy: Golder Associates)

The Phase 2 investigation included a ground-water investigation, collection and analysis of soil samples from drill holes, trenches and sample pits and collection and analysis of concrete cores from the shop floor and wipe samples from the shop walls (Bechtel, 1987).

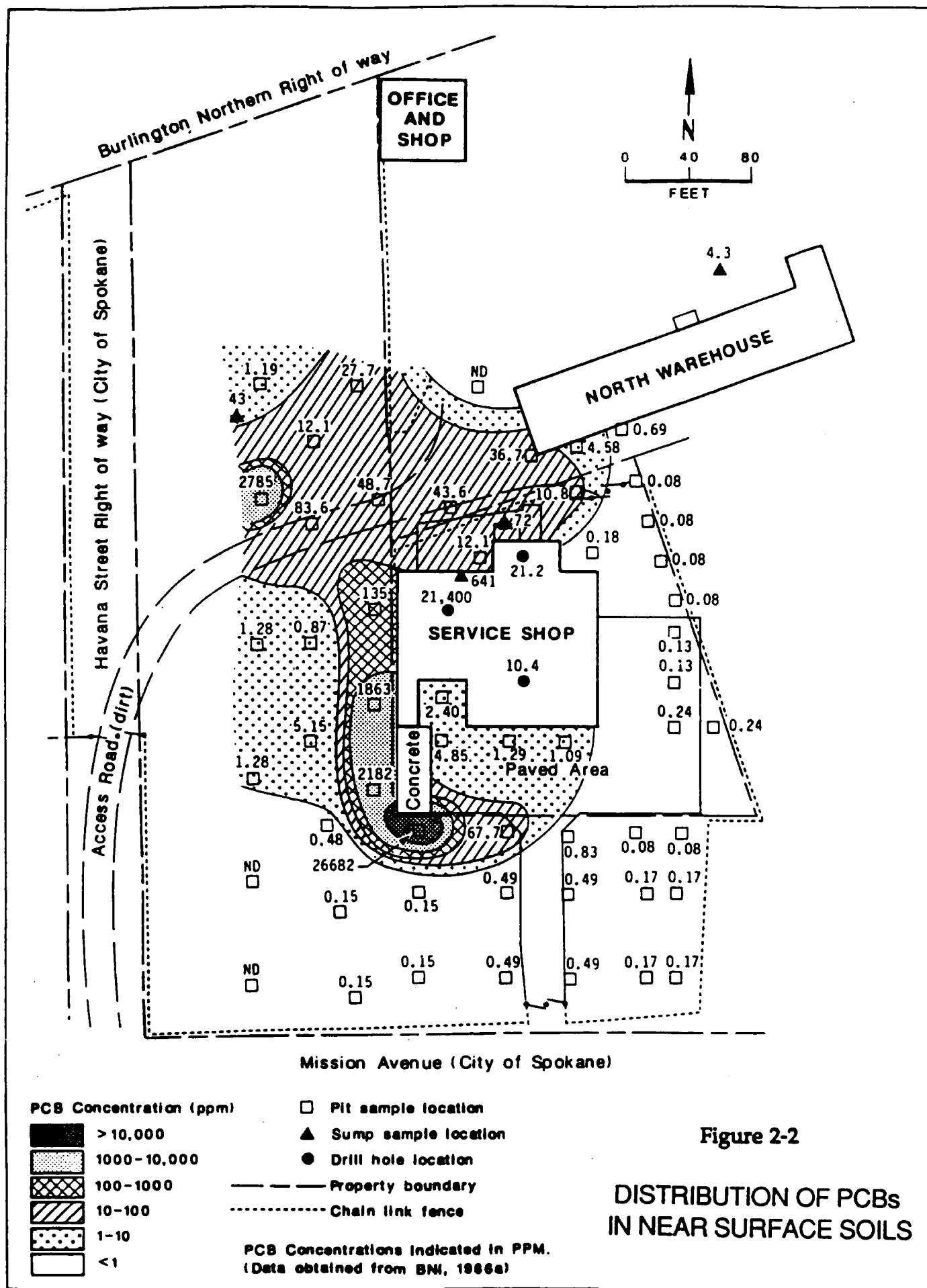
An overflow pipe leading from the West Dry Well to a buried gravel filled drum (S2) was identified during the investigation. The overflow pipe terminated approximately 180 feet northwest of the dry well. A sample test pit (P36) was excavated at the discharge point. PCB concentrations ranged from 0.15 ppm to 3,528 ppm (P36-4.5) in shallow soil samples (0-6 feet). Toluene was detected in sample P36-4.5 at 150 parts-per-billion (ppb) and total xylenes were detected at 1,200 ppb.

PCBs were reported at concentrations of 244 ppm (0-0.5 foot) and 2 ppm (5.2-5.7 foot) in soil samples collected at MW2. Samples MW2-37.0 and MW2-41.1 contained both methylene chloride and trichlorofluoromethane (Freon 11).

Five ground-water monitoring wells were installed during the Phase 2 ground-water investigation. A ground-water sample from monitoring well MW5, located approximately 40 feet downgradient of the West Dry Well, was found to contain 2.66 parts-per-billion (ppb) PCBs, which approaches the solubility limit for Aroclor 1260 (2.7 ppb at 20 °F) in water .

Golder conducted the Phase 3 Remedial Investigation in 1988 (Golder, 1988). Seven exploratory borings were drilled and sampled on the site. Six of the borings were completed as monitoring wells. Ground-water monitoring well locations are shown on Figure 2-2. Soil samples were analyzed for volatile organics, chlorinated benzenes, PCBs, petroleum hydrocarbons, metals and priority pollutants. Most samples were analyzed on site using a field gas chromatograph. Selected samples were analyzed in the field for volatile organics, tri- and tetra-chlorinated benzenes and total PCBs.

Analytical results of the ground-water sampling indicated that tetrachloroethylene was present in very low concentrations (less than 0.75 ppb) in all the wells with the exception of MW3, MW9U and MW9L during the Phase 3 sampling. Very low concentrations (less than 0.33 ppb) of



(Courtesy: Golder Associates)

1,1,1-trichloroethane were present in in all wells with the exception of MW1, MW7A, MW9U and MW9L. These contaminants are reported to be commonly detected in the local shallow aquifer, however the highest concentrations were found in the wells down gradient of the West Dry Well. Benzene was present in three of the perimeter wells (MW9U, MW9L and MW11) at concentrations at or below the EPA maximum contaminant level (MCL) of 5 ppb. Petroleum hydrocarbons were detected in very low concentrations (less than 1 ppm) in all of the wells sampled with the exception of MW7A which had a concentration of 17 ppm.

PCBs (Aroclor 1260) were detected in monitoring wells MW5, MW8, and MW11. A PCB concentration close to the solubility limit for Aroclor 1260 was again detected upon resampling monitoring well MW5. Monitoring wells MW2, MW6, MW9U, MW9L and MW10 contained suspected PCB congeners.

To summarize, the results of the Phases 1, 2 and 3 investigation activities indicated that PCBs are distributed in surface and near surface soils at concentrations greater than 1 ppm to the north, south and west of the former Service Shop. Concentrations greater than 10 ppm occur in the area north and west of the Service Shop and along the western and southwestern perimeter of the shop and adjacent paved areas. Concentrations in excess of 1,000 ppm occur in soils underlying the concrete floor around the West Dry Well and North Sump, adjacent to the concrete pad along the southwest corner of the site and near the discharge point of the West Dry Well overflow outlet. The higher concentrations of PCBs are generally confined to the surface soils. Concentrations generally diminish to below 1 ppm at a depth of 3 feet. The distribution of chlorinated benzenes appears to be associated with the presence of PCBs (Golder, 1988).

PCBs have migrated vertically beneath the West Dry Well and its overflow outlet. PCB concentrations in soils near the West Dry Well overflow outlet (sample location P36) were reported as 158 ppm at a depth of 6 feet. Lead, copper and zinc were also detected at elevated concentrations.

The results of the ground-water sampling indicate that selected volatile organics, petroleum hydrocarbons and PCBs are present in the shallow aquifer. The highest concentration of PCBs (2.66 ppb) was detected at MW5 which is directly down

gradient of the West Dry Well. The present lateral and vertical extent of the contaminated ground water is presently undefined. Further characterization of the plume will be accomplished in the Phase 5 RI.

Section 3

FEASIBILITY STUDY

Overall remedial action objectives for the site consist of medium-specific goals for protecting human health and the environment. Development of specific objectives involves identification of the media of concern and contamination characteristics, evaluation of exposure pathways for contaminant migration, and determination of acceptable exposure at the receptor points.

The feasibility study will be carried out in the following two phases:

- Phase 1 Feasibility Study - a detailed study of remedial alternatives for contaminated soils and debris
- Phase 2 Feasibility Study - a detailed study of remedial alternatives for ground water and contaminated deep soils associated with ground-water fluctuations.

The development of alternatives will involve assembling combinations of remedial technologies applicable to each contaminated medium. A number of different alternatives will be assembled. These alternatives will be screened to reduce the number of alternatives that will be analyzed in detail. The alternatives brought through the screening process will then be further refined and analyzed in detail with respect to a set of evaluation criteria (EPA, 1988) and WAC 173-340.

3.1 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

The development of remedial action alternatives will involve five subtasks. Each subtask will be performed separately for both the Phase 1 and Phase 2 FS reports.

The subtasks include:

- Development of remedial objectives
- Development of response actions
- Determination of volume and area of contaminated media
- Identification and screening of remedial technologies and process options to select a representative process for each technology
- Development of remedial alternatives by assembling the selected technologies.

These subtasks are described further below.

3.1.1 Development of Remedial Action Objectives

Remedial action objectives will be developed for each contaminated medium based on identified contaminated media, nature of contaminants, the exposure pathways and in conjunction with applicable or relevant and appropriate requirements (ARARS). For example, the remedial investigations at the GE site have shown that shallow soil is contaminated with PCBs and, in several areas, with chlorinated benzenes, petroleum hydrocarbons and metals (primarily copper, lead and zinc). The remedial action objectives for shallow soils may include:

- Preventing direct contact with contaminants, including both ingestion of soil and dermal contact with soil.
- Preventing surface water contamination. Contaminants in the surface soils carried and deposited by surface runoff could pose a threat to humans through ingestion or dermal contact.
- Preventing ground-water contamination. Shallow soil contaminants may migrate into the unconfined ground-water aquifer and contaminate down-gradient water resources.
- Preventing wind erosion of contaminants which may result in inhalation of contaminant-laden soil particles originating from onsite soils.

Development of specific remedial objectives will involve identification of contaminants and affected media based on site assessment, evaluation of contaminant migration, and determination of acceptable exposure levels at the receptor points.

The media and contaminants of concern were summarized in Section 2. The summary will be expanded and included in the Phase 1 and Phase 2 feasibility study reports.

3.1.2 Development of General Response Actions

The objective of this task is to develop site-specific response actions. Those general actions such as removal/treatment or containment of contaminated media that satisfy the specific remedial objectives will be identified. Developing general response actions is an iterative process that takes place at several points during the RI/FS process. As more data are collected, alternatives (response actions, technologies, and remedial alternatives) are rescreened or modified.

For each general response action, more than one remedial technology may be applicable. General response actions will be identified for specific media and objectives. General response actions which may be considered in this task for the Phase 1 FS include:

For contaminated soils and debris:

1. No action/Institutional controls
2. Containment - Contact or migration barriers
3. Excavation/Treatment/Disposal.

General response actions which may be considered in this task for the Phase 2 FS include:

For contaminated deep soil:

1. No action/Institutional controls
2. Containment - Contact or migration barriers
3. Excavation/Treatment/Disposal
4. In-situ treatment.

For ground water:

1. No action/Institutional controls
2. Containment
3. Collection/Treatment/Disposal.

3.1.3 Determination of Areas and Volumes of Contaminated Media

To develop remedial action alternatives, volumes or areas of contaminated media have to be determined. Determination of volumes or areas of contaminated media is an iterative process that will be refined as the RI/FS progresses. In certain cases, such as the excavation of soil, determination of the exact volumes or areas may not happen until actual excavation.

For this site, volumes and areas of contaminated material will be defined based on specific contaminants or groups of contaminants, locations and contaminant concentrations. Contaminated media at the GE Spokane site, contaminants and locations are summarized in Table 3-1. This summary is based on data collected to date and will be upgraded as the RI/FS progresses.

TABLE 3-1
SUMMARY OF CONTAMINATED MEDIA

Contaminated Media	Location	Major Contaminants
Shallow Soil	West, north, south of and beneath former Service Shop and adjacent remaining concrete and asphalt paving	PCBs Chlorinated benzenes Volatile Organics Metals Petroleum Hydrocarbons
Remaining Underground Structures and Associated Soil	West Dry Well and all other sampled structures	PCBs Chlorinated benzenes Volatile Organics Metals Petroleum Hydrocarbons
Remaining Concrete/Asphalt	Service Shop floor, concrete and asphalt paving	PCBs
Deep Soil	Soil near ground- water table	PCBs Volatile Organics Petroleum Hydrocarbons
Ground Water		PCBs Chlorinated benzenes Volatile Organics Petroleum Hydrocarbons

3.1.4 Identification and Screening of Remedial Technologies

The objective of this task is to select technologies and process options to be used to formulate remedial alternatives. For each of the general response actions developed in the previous task, feasible technologies and process options will be identified. These technologies and process options will then be screened based on their applicability to specific site conditions. Some of the general response actions and corresponding technologies to be considered for the GE Spokane site are summarized in Table 3-2.

The universe of potentially applicable treatment technologies is reduced by screening of technologies with respect to technical implementability while considering specific site conditions, specific media of concern and existing contaminants. Several broad technology types may be identified for each general response action, and numerous technology process options may exist within a technology type. As technologies pass the initial screening based on implementability, process options within the technology are evaluated to select one representative process option for each technology, if possible. The selection of process options is based on effectiveness, implementability and approximate costs.

3.1.5 Development of Remedial Alternatives

In the development of remedial alternatives, the process options chosen to represent the various technologies for each of the media are combined to form alternatives for the GE Spokane site as a whole. For a given medium there may be more than one remedial objective, each objective having several general response actions. For each general response action, more than one technology may be selected.

In the case of the Spokane site, there are at least three media of concern which will be addressed in the Phase 1 FS. These are: 1) contaminated shallow soil; 2) soils beneath the Service Shop floor, concrete slabs, asphalt paving, and underground structures; any remaining contaminated concrete and asphalt paving; and 3) contaminated soils in the West Dry Well area. The Phase 2 FS will address ground water and contaminated soils related to ground-water fluctuations. For each

TABLE 3-2
PRELIMINARY LIST OF REMEDIAL TECHNOLOGIES

Media	Remedial Objective	General Response Action	Remedial Technologies
Shallow Soil	Prevent direct contact	No action/ Institutional controls	Fencing, deed restrictions
	Prevent wind erosion of contaminants. Prevent surface and ground-water contamination	Containment	Capping, vegetation
		Excavation/Treatment/ Disposal	Excavation, fixation, physical treatment, chemical treatment, thermal treatment
Remaining Underground Structures and Concrete/Asphalt	Prevent direct contact	No action/ Institutional controls	Fencing, deed restrictions
	Prevent surface and ground-water contamination	Containment	Capping
		Excavation/Treatment/ Disposal	Excavation, fixation, physical treatment, chemical treatment, thermal treatment
Deep Soil	Prevent contaminant migration into the ground water	No action/ Institutional controls	Fencing, deed restrictions
		Containment	Capping, subsurface barriers
		Excavation/Treatment/ Disposal	Excavation, fixation, physical treatment, chemical treatment, thermal treatment
		In-situ treatment	Fixation, chemical treatment
Ground Water	Prevent ingestion of contaminated ground water	No action/ Institutional controls	Fencing/Monitorings /Use restrictions
		Containment	Capping, hydraulic barriers
		Collection/Treatment	Extraction, physical, chemical biological treatment
	Restore ground-water aquifer	No action	Natural degradation
		Containment	Capping, hydraulic barriers
		Collection/Treatment	Extraction, physical, chemical biological treatment

medium there may be one to four remedial action objectives and at least three general response actions for each remedial objective.

3.2 SCREENING OF REMEDIAL ALTERNATIVES

The objective of alternative screening is to narrow the list of many potential alternatives that will be evaluated in detail. The screening will be based on the effectiveness of the alternatives, implementability, and approximate costs. Five or six of the alternatives judged as the best or most promising will be selected for evaluation in further detail.

A key aspect of the alternative screening process is the effectiveness of each alternative in protecting human health and the environment. Each alternative will be evaluated based on its protectiveness and its ability to effect a reduction in the toxicity, mobility or volume of contaminants.

Implementability will be evaluated based on the technical and administrative feasibility of constructing, operating and maintaining the alternative. The alternatives which are not technically feasible or not available at this time will not be considered further. The cost data necessary for alternative screening will be based on published data such as cost curves, generic unit costs, vendor information, and similar estimates.

3.3 DETAILED ANALYSIS OF ALTERNATIVES

The objective of the detailed analysis of the alternatives is to develop the information necessary to select the site remedial action. The detailed analysis involves assessment of each alternative against the evaluation criteria. The results of the assessment will be organized to allow comparison of the alternatives.

The evaluation criteria consist of threshold criteria and primary criteria. The threshold criteria relate directly to statutory findings that must ultimately be made in the Record of Decision (ROD). Therefore, each alternative must satisfy the threshold criteria. The primary criteria are used to evaluate the technical, cost,

institutional and risk concerns of the various alternatives. The threshold and primary criteria are described below.

The threshold evaluation criteria are:

- **Protection of Human Health and the Environment:** evaluates how the alternatives protect and maintain protection of human health and the environment from existing and future health hazards and discusses whether the remedial action objectives are met
- **Attainment of cleanup standards and compliance with applicable federal, state and local laws** (applicable or relevant and appropriate requirements).

The primary evaluation criteria are :

- **Short-term Effectiveness:** examines the effectiveness of the alternative in protecting human health and the environment during the construction and implementation phase
- **Long-term Effectiveness:** evaluates the long-term effectiveness of the alternative in protecting human health and environment after the remedial action objectives have been met
- **Reduction of Toxicity, Mobility or Volume (TMV):** evaluates the anticipated performance of the specific treatment technologies that comprise the alternatives
- **Implementability:** evaluates the technical and administrative feasibility of alternatives and the availability of required resources
- **Cost:** evaluates the capital costs and operating and maintenance costs (O&M) of the alternatives

Additional criteria include:

- State Acceptance: reflects the state's preferences among or concerns about alternatives.
- Community Acceptance: reflects the community's preferences among or concerns about alternatives.

To conduct the detailed analysis, each alternative has to be defined in detail and assessed against the threshold and primary criteria. The results of the assessment will be compared to determine relative performance of each alternative with respect to each evaluation criteria.

Definitions of alternatives will progress during the screening of technology-process options and development and screening of alternatives. During the detailed analysis, additional definitions of alternatives may be required to develop cost estimates.

Each alternative will be analyzed against the evaluation criteria independently, without the consideration of interrelationships between alternatives. Once an alternative is analyzed, the relative performance of each alternative will be evaluated.

3.4 SUMMARY OF REMEDIAL ALTERNATIVES

A narrative summary describing all of the factors used to evaluate each remedial alternative will be used to compare the alternatives with one another. The summary will highlight important differences between alternatives and identify the advantages and disadvantages of each alternative relative to each other.

3.5 PREPARATION OF THE FEASIBILITY STUDY REPORTS

Upon completion of the remedial alternatives screening and evaluation tasks for each FS phase, a feasibility study report summarizing the results of the

work tasks will be prepared. The FS report will contain the following major sections:

- Executive Summary
- Introduction
- Remedial Action Objectives
- General Response Actions
- Determination of Areas and Volumes of Contaminated Waste
- Identification and Screening of Remedial Technologies
- Remedial Action Alternatives
- Detailed Analysis of Remedial Alternatives
- Summary of Remedial Alternatives.

The introduction of each FS report will include a summary of the findings of the applicable remedial investigations and the risk assessment. The remaining sections will summarize the work performed under the tasks outlined in Sections 3.1 through 3.4 above.

Two drafts of the final report for each FS phase of the the project will be issued. The first draft will be submitted to Ecology for review. Ecology comments will be incorporated into the second draft of each document which will be issued for public comment. Following public comment a final FS report will be issued.

Section 4

SCHEDULE AND DELIVERABLES

A breakdown of the Phase 1 and Phase 2 FS tasks and schedules for their completion are presented in Figures 4-1 and 4-2. The schedule for the Phase 4 RI and Phase 5 RI will begin upon Ecology approval of the respective work plans. The Phase 1 FS work can be started simultaneously with the Phase 4 RI work, however, the Phase 1 FS cannot be completed without the additional data provided by the Phase 4 RI. The Phase 2 FS will start after the Phase 5 RI is underway. The overall RI/FS project schedule is presented in Figure 4-3.

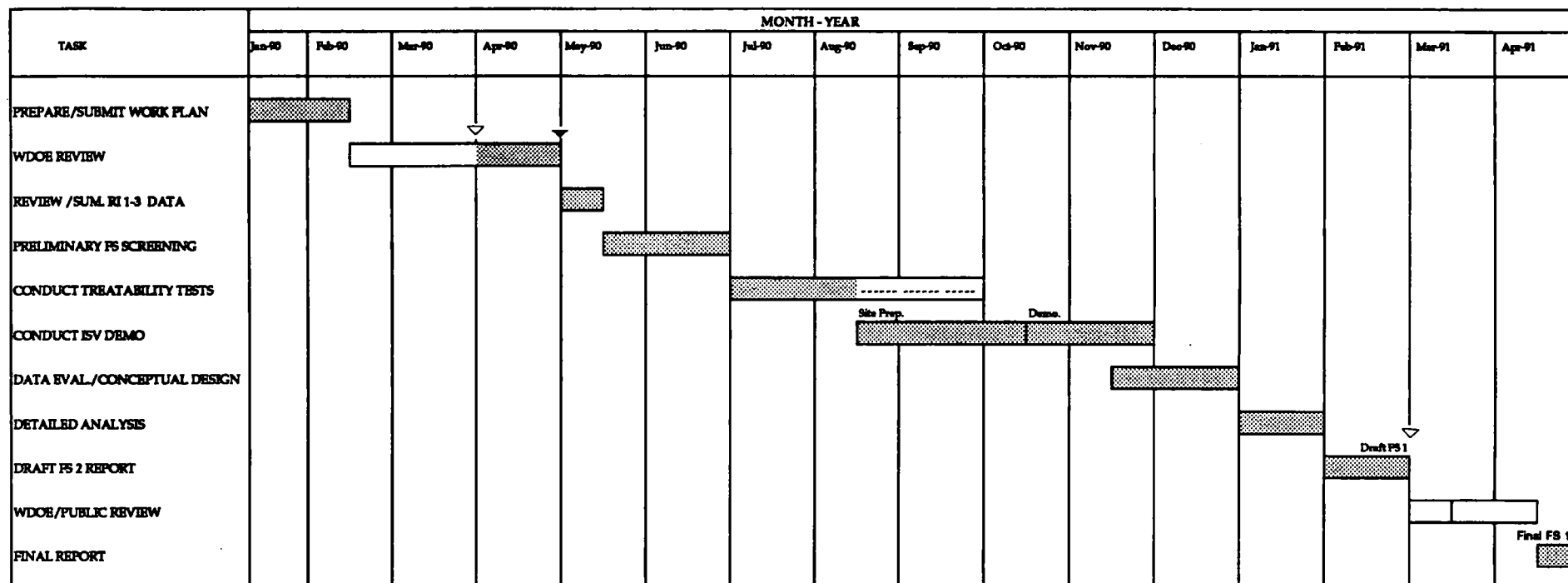


FIGURE 4-1
 PHASE 1 FEASIBILITY STUDY SCHEDULE
 GENERAL ELECTRIC COMPANY
 FORMER SPOKANE SERVICE SHOP SITE

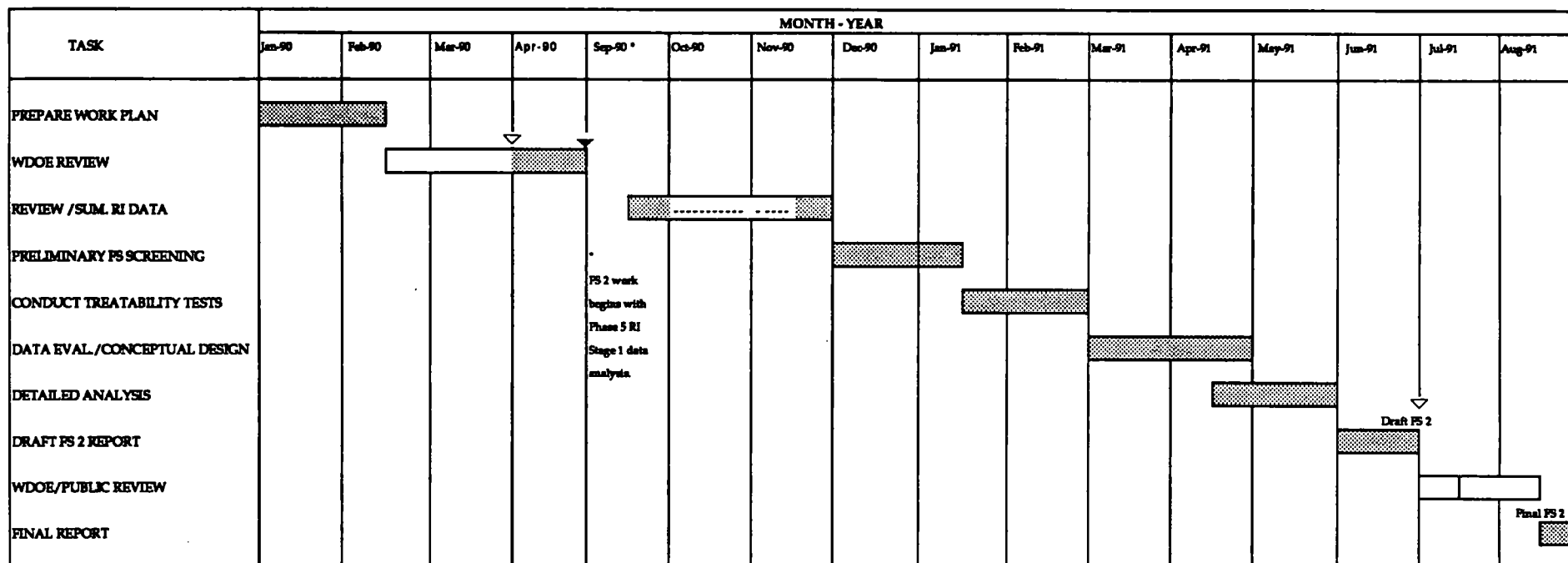
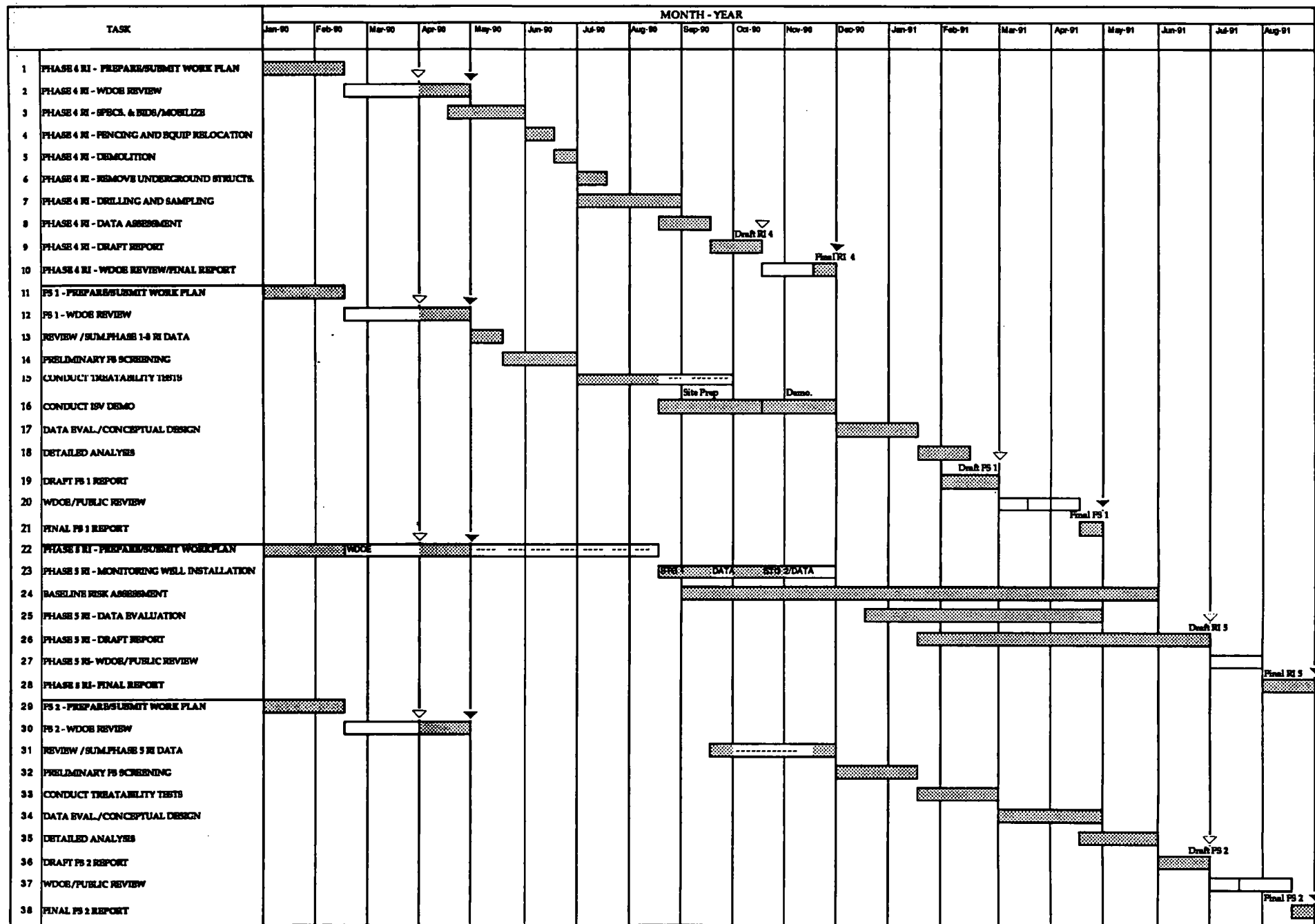


FIGURE 4-2
 PHASE 2 FEASIBILITY STUDY SCHEDULE
 GENERAL ELECTRIC COMPANY
 FORMER SPOKANE SERVICE SHOP SITE



RI/FS PROJECT SCHEDULE - SPOKANE SERVICE SHOP SITE
GENERAL ELECTRIC COMPANY

FIGURE 4-3

Section 5

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